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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/807,823	04/19/2001	Masakazu Okuda	DP-548 US	6176

7590 03/13/2003

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EXAMINER	
NGUYEN, LAM S	
ART UNIT	PAPER NUMBER
2853	

DATE MAILED: 03/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/807,823	OKUDA, MASAKAZU	
	Examiner	Art Unit	
	LAM S NGUYEN	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 February 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable by Chang (EP 0947325) in view of Sakai (US 5933168) and Ebi et al. (US 4364057).

Chang discloses a method for driving an ink jet recording head which method applies a driving voltage to an electromechanical converter (in term of "piezoelectric") (column 1, line 8) to deform the electromechanical converter to thereby change a pressure in the pressure generating chamber filled with ink (FIG. 3, element 2), thus ejecting ink droplets through a nozzle (FIG. 3, element 13) in communication with the pressure generating chamber, the method being characterized in that a voltage waveform of said driving voltage comprises:

at least a first voltage changing process (FIG. 4(b), element b) for applying a voltage in a direction that increases a volume of said pressure generating chamber;

a second voltage changing process (in term of "a first contraction region") (FIG. 4(b), element d) (column 13, line 5) for then applying a voltage in a direction that reduces the volume of said pressure generating chamber; and

a third voltage changing process (in term of "first expansion region") (FIG. 4(b), element f: T1) (column 13, line 13-14) for applying a voltage in a direction that increases the volume of said pressure generating chamber again;

setting voltage changing times t2 and t3 during the second and third voltage changing processes are set to have such lengths as shown below, relative to a resonance frequency Tc. of a pressure wave generated in the pressure generating chamber:

$0 < t2 < Tc/2$ (column 7, line15-19)

$0 < t3 < Tc/2$ (column 13, line 48-49)

Referring to claim 19: a start time to said third voltage changing process is about the same as an end time of said second voltage changing process (column 13, line 10-11: the width of a third hold region e is approximately 0).

Referring to claims 20, 21: a fourth voltage changing process (in term of "the second contract region") (FIG. 4(b), element h; column 14, line 15) for applying a voltage in a direction that reduces the volume of said pressure generating chamber, after said first voltage changing process, said second voltage changing process, and said third voltage changing process, wherein the voltage changing time t4 during said fourth voltage changing process (in term of "the second contract region") (FIG. 4(b), element h; column 14, line 15) is set as follows relative to the resonance frequency T, of the pressure wave generated in said pressure generating chamber:

$0 < t4 < T/2$ (column 7, line 15-19)

Referring to claim 22: wherein a time interval between a start time of said second voltage changing process and a start time of said fourth voltage changing process is set substantially half the length of the resonance frequency Tc of the pressure wave generated in said pressure generating chamber (column 16, line 3 teaches that the widths of the expansion region and the contraction region are equal. In addition; column 13, line 49 suggests that the width of the expansion region is no more than ¼ Tc (means that it may be equal to ¼ Tc). Moreover; column 13, line 10-11 recommends that the width of the third hold region is approximately 0.

Therefore, the time interval between a start time of said second voltage changing process and a start time of said fourth voltage changing process is substantially half the length of the resonance frequency Tc).

Chang does not disclose the providing said nozzles with an about 20 to about 30 micrometers opening diameter to eject said ink droplets in size of about 5 to about 25 micrometers size.

Sakai discloses the providing nozzles with an about 30 micrometers opening diameter to eject said ink droplets in size of about 5 to about 25 micrometers size (column 10, lines 25-28: the ink droplet could be reduced by only 60-80% of the normal size ink droplet; column 1, line 25-30: the normal size ink droplet is the size set by the size of the nozzle opening; column 6, line 42: the nozzle opening has an aperture of 32 μm (about 30 μm). Therefore, the size of the ink drop is about 19,2 to 25,6 μm).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to include the providing of nozzles with an about 30 micrometers opening diameter to eject ink droplets in size of about 5 to about 25 micrometers as disclosed by Sakai into the printhead disclosed by Chang. The motivation of doing so is to avoid the disadvantages due to the size of the reduced size ink droplet created is so small compared with the size of the nozzle opening in order to stably eject ink droplets with a required amount of kinetic energy as taught by Sakai (column 2, lines 10-26).

In addition, Ebi et al. suggest the reducing of the diameter of a nozzle; for example, 30 microns (column 3, line 36) to generate the ink drops with an extremely fine diameter (column 3, line 15-31).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to set the diameter of nozzles in the printhead disclosed by Chang about 30 microns as disclosed by Ebi et al. The motivation of doing so is to generate the ink drops with an extremely fine diameter whereby the density of ink dots can be increased and consequently the resolution can be improved as taught by Ebi et al. (column 3, line 15-21).

Response to Arguments

Applicant's arguments with respect to claims 18-22 have been considered but are moot in view of the new ground(s) of rejection.

Regarding to the argument on page 10-11 referring to claims 18-22: The applicants argued that the cited references fail to disclose the providing a nozzle with an about 20 to about 30 microns opening. However, as discussed above, the Sakai reference discloses a nozzle whose opening is 32 microns (about 30 microns), and the Ebi et al. reference discloses a nozzle having a 30 microns opening. Therefore, the claimed invention is disclosed under the combination of the cited prior arts.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (703)305-3342. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOHN E BARLOW can be reached on (703)308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are (703)305-3431 for regular communications and (703)305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

LN

February 26, 2003

John Barlow
Supervisory Patent Examiner
Technology Center 2800